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(54) Abstract Title
Multi-user video recording system

(57) A video recording system is described to facilitate time-shifting of television program viewing for multiple users. Each user is identified by an associated user profile which may contain restrictions on viewing times or program content. A program schedule, including a list of programs to be recorded, is maintained for each user. The television programs are recorded and stored in a compressed format on a hard disk, or other non-volatile storage, for later viewing by the users. Each user can log into the system and view any of the television programs that have been recorded for him. A master user, such as a parent, can add a new user to the system by setting up a new user profile. A permanent copy of a television program can be written to another medium, such as a compact disk, DVD, or videocassette tape.

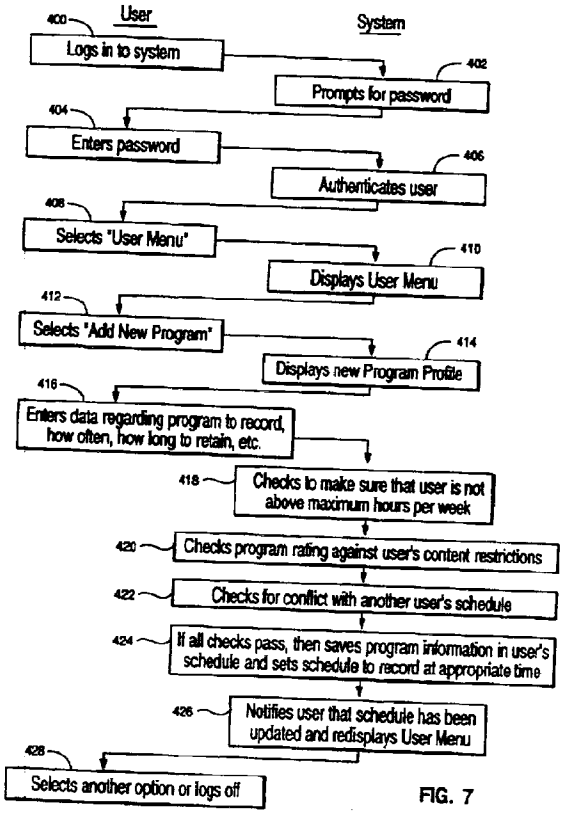

FIG. 7

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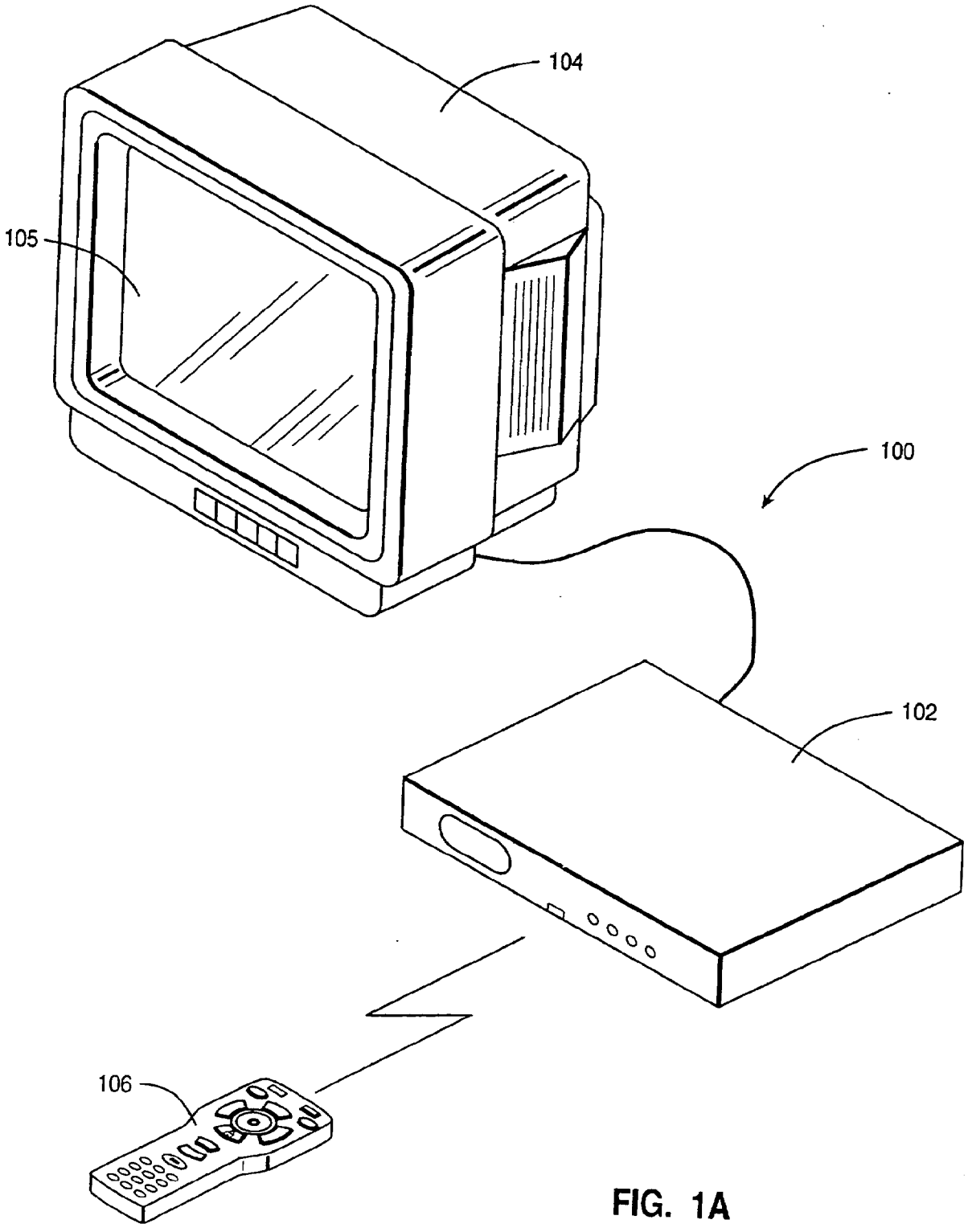

FIG. 1A

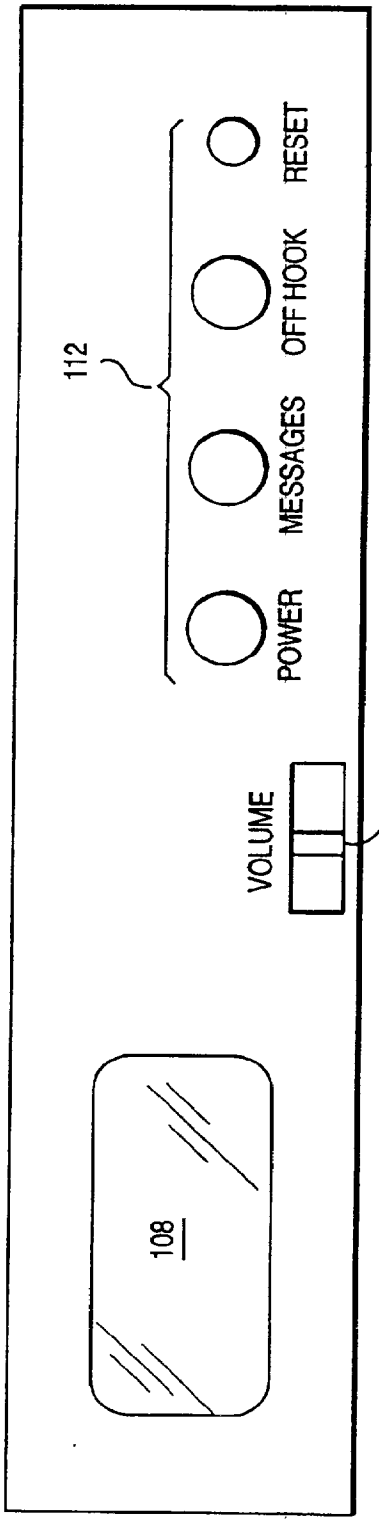

FIG. 1B

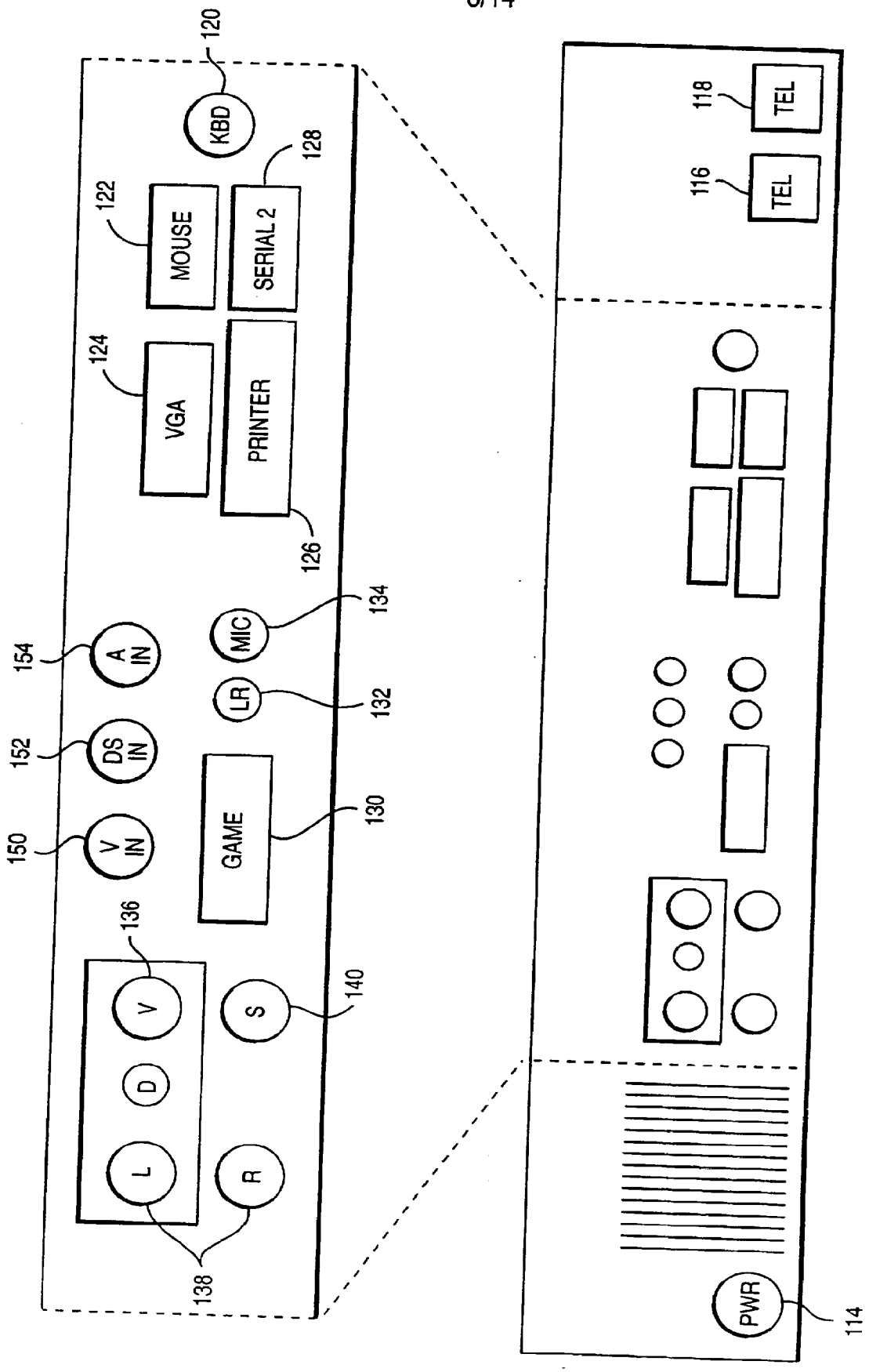
120
KBD
122
MOUSE
128
SERIAL 2
124
VGA
PRINTER
126
154
A IN
134
MIC
LR
132
152
DS IN
GAME
130
150
V IN
136
V
D
L
R
138
S
140
118
TEL
116
TEL
PWR
114

FIG. 1C

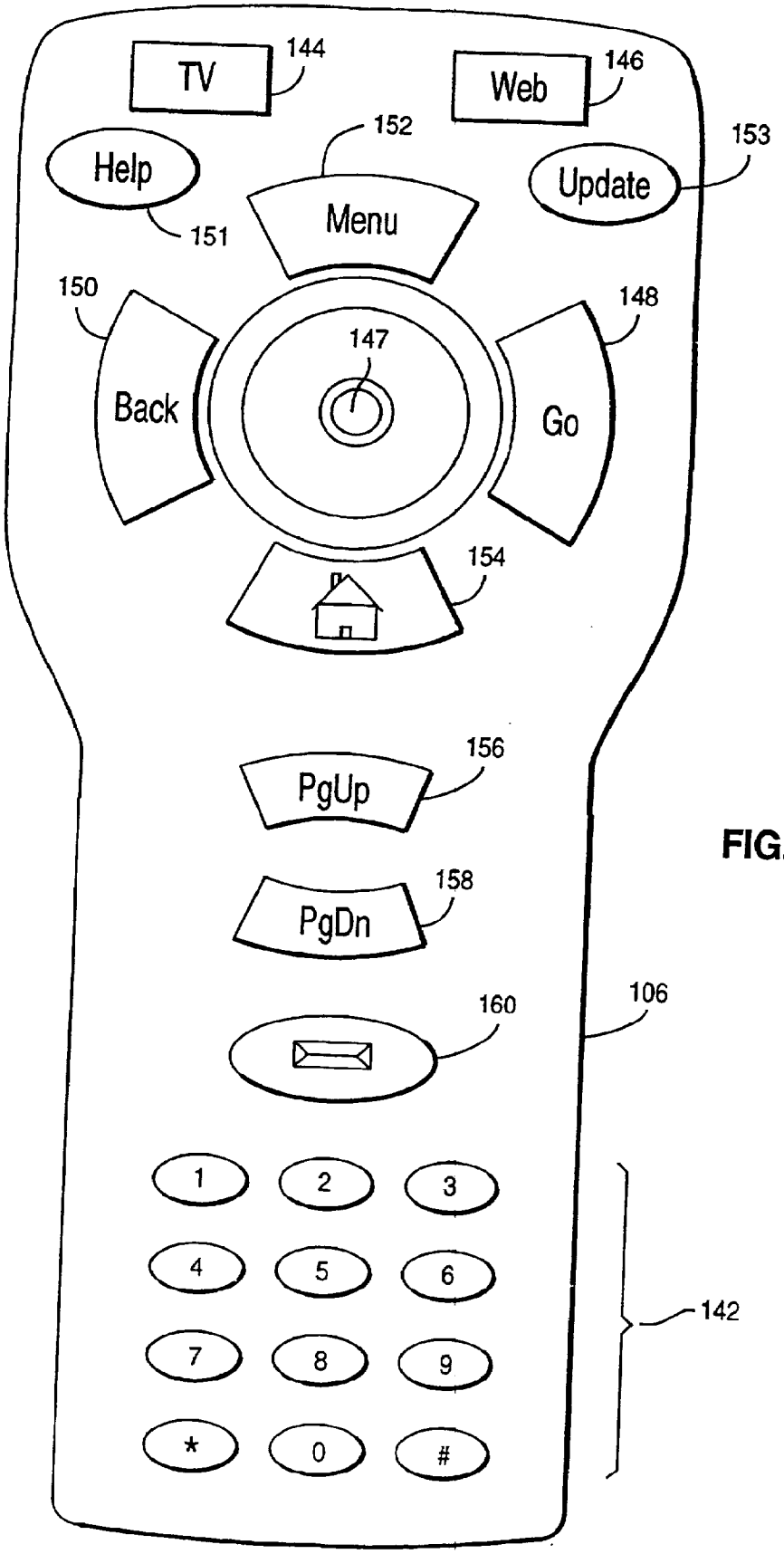
TV
144
Web
146
152
153
Help
Update
Menu
151
150
148
147
Back
Go
154
156
PgUp
158
PgDn
106
160
1
2
3
4
5
6
7
8
9
*
0
#
142

FIG. 1D

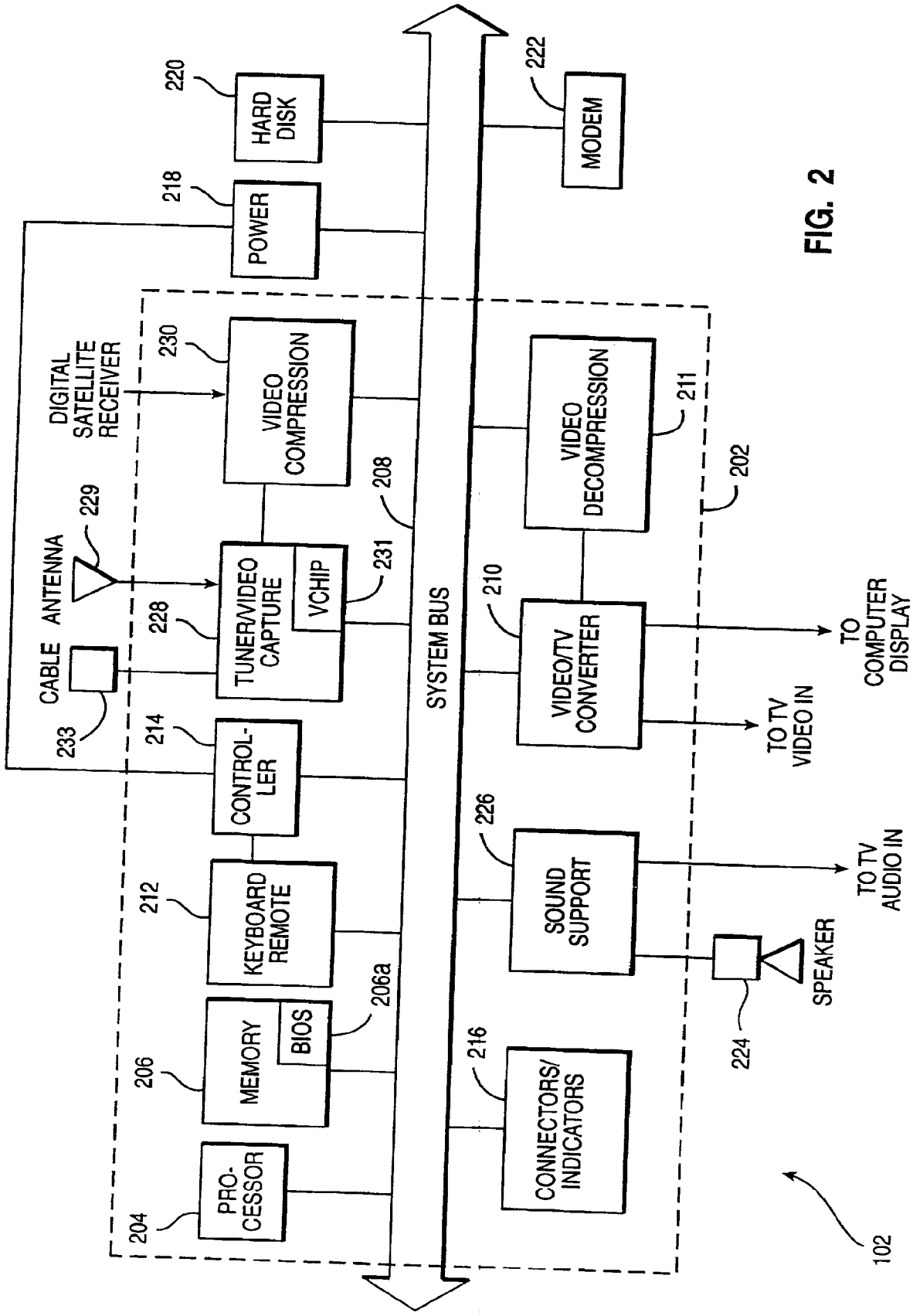
HARD DISK
220
POWER
218
MODEM
222
DIGITAL SATELLITE RECEIVER
VIDEO COMPRESSION
230
VIDEO DECOMPRESSION
211
202
208
ANTENNA
229
TUNER/VIDEO CAPTURE
VCHIP
231
228
CABLE
233
CONTROL-LER
214
SYSTEM BUS
VIDEO/TV CONVERTER
210
TO COMPUTER DISPLAY
TO TV VIDEO IN
KEYBOARD REMOTE
212
SOUND SUPPORT
226
TO TV AUDIO IN
206a
MEMORY
BIOS
206
SPEAKER
224
CONNECTORS/ INDICATORS
216
PRO-CESSOR
204
102

FIG. 2

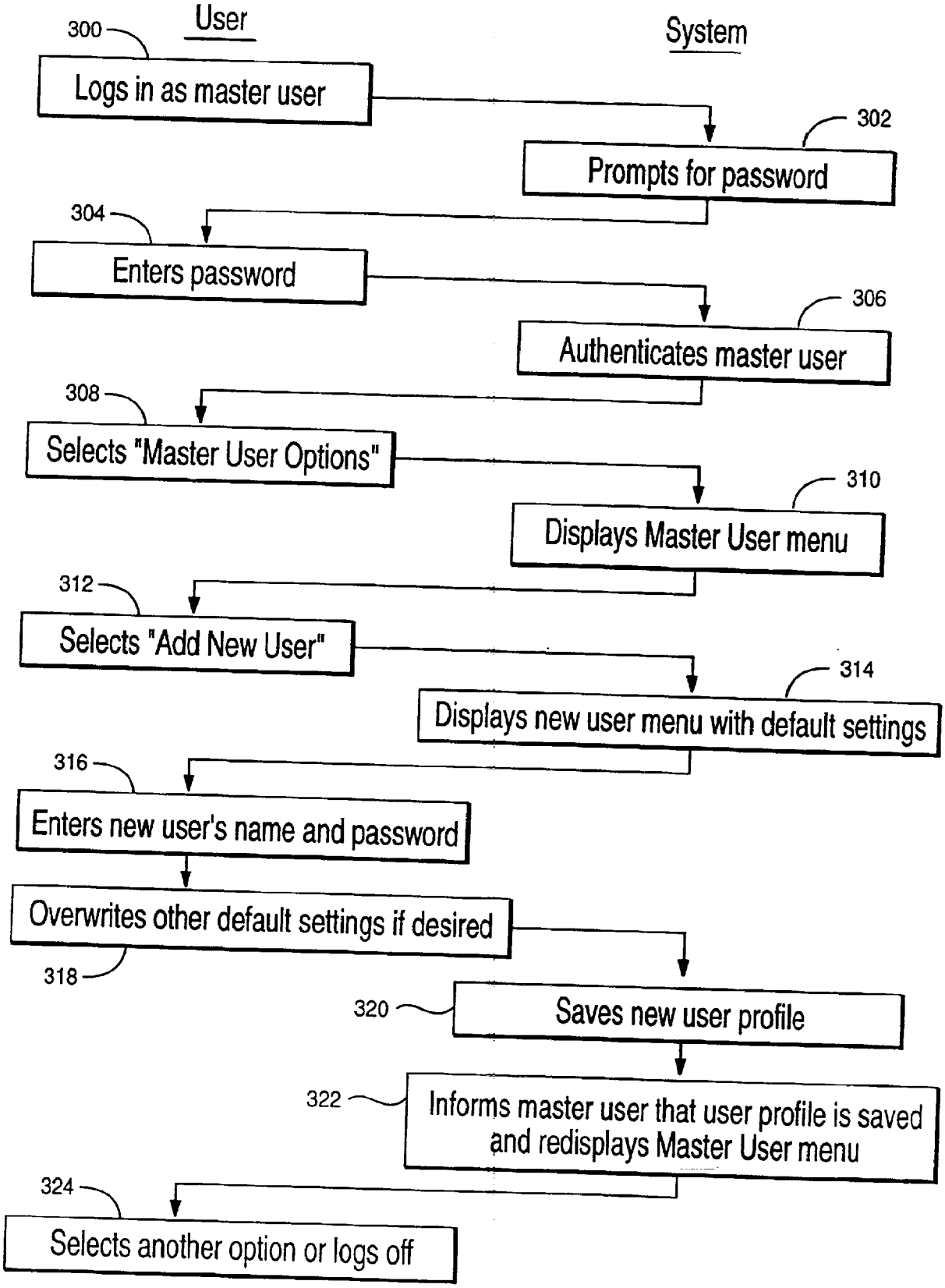
User
System
300
Logs in as master user
302
Prompts for password
304
Enters password
306
Authenticates master user
308
Selects "Master User Options"
310
Displays Master User menu
312
Selects "Add New User"
314
Displays new user menu with default settings
316
Enters new user's name and password
Overwrites other default settings if desired
318
320
Saves new user profile
322
Informs master user that user profile is saved and redisplays Master User menu
324
Selects another option or logs off

FIG. 3

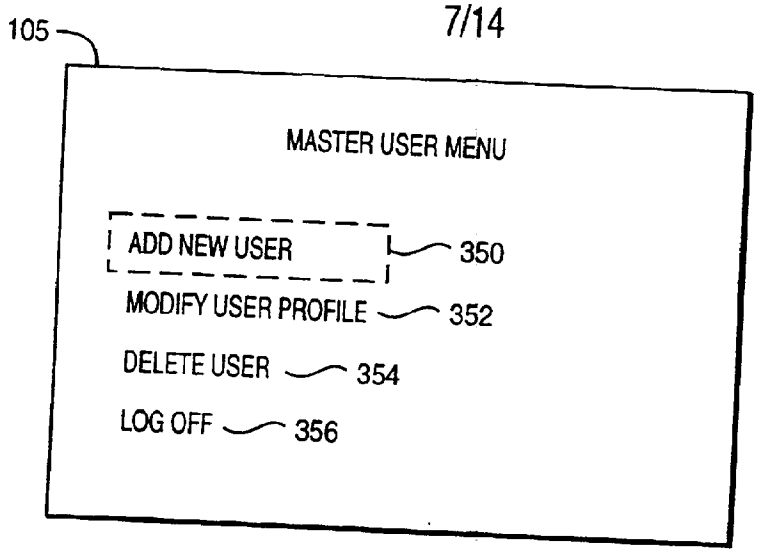

FIG. 4

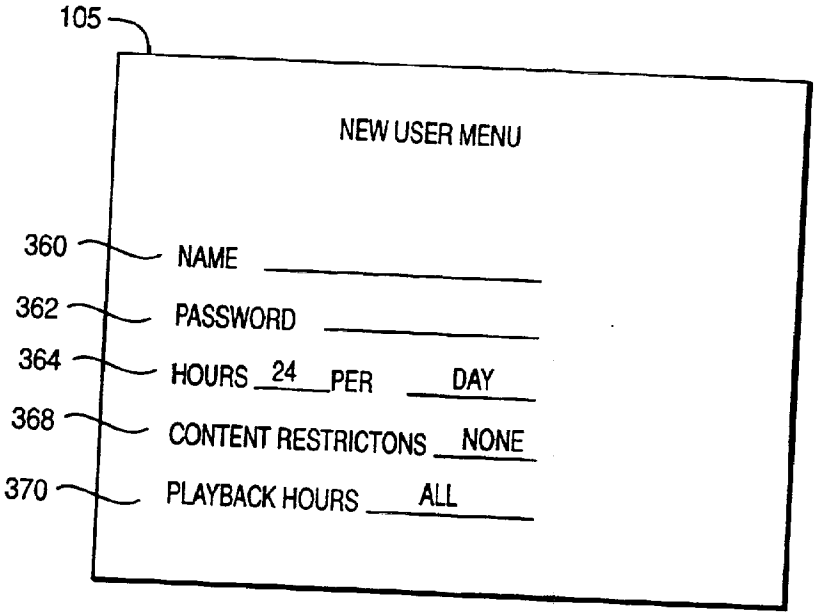

FIG. 5

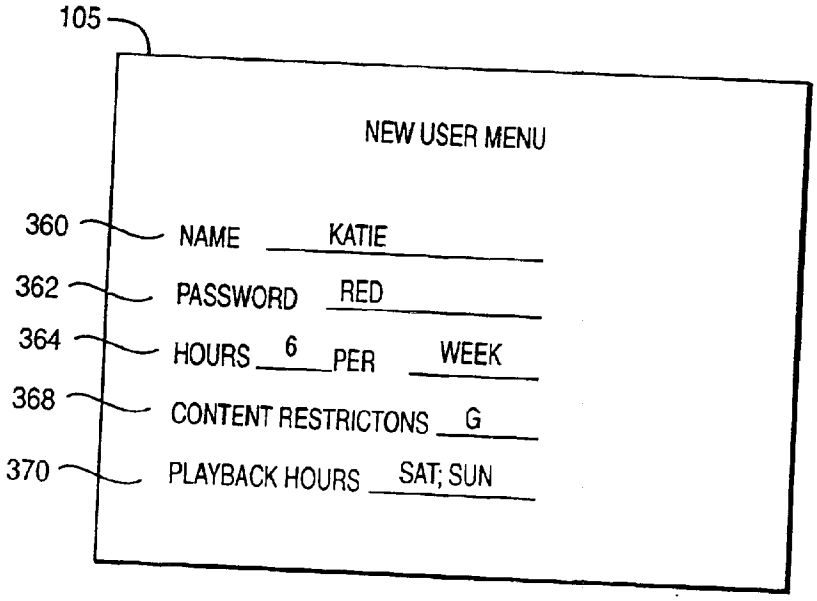

FIG. 6

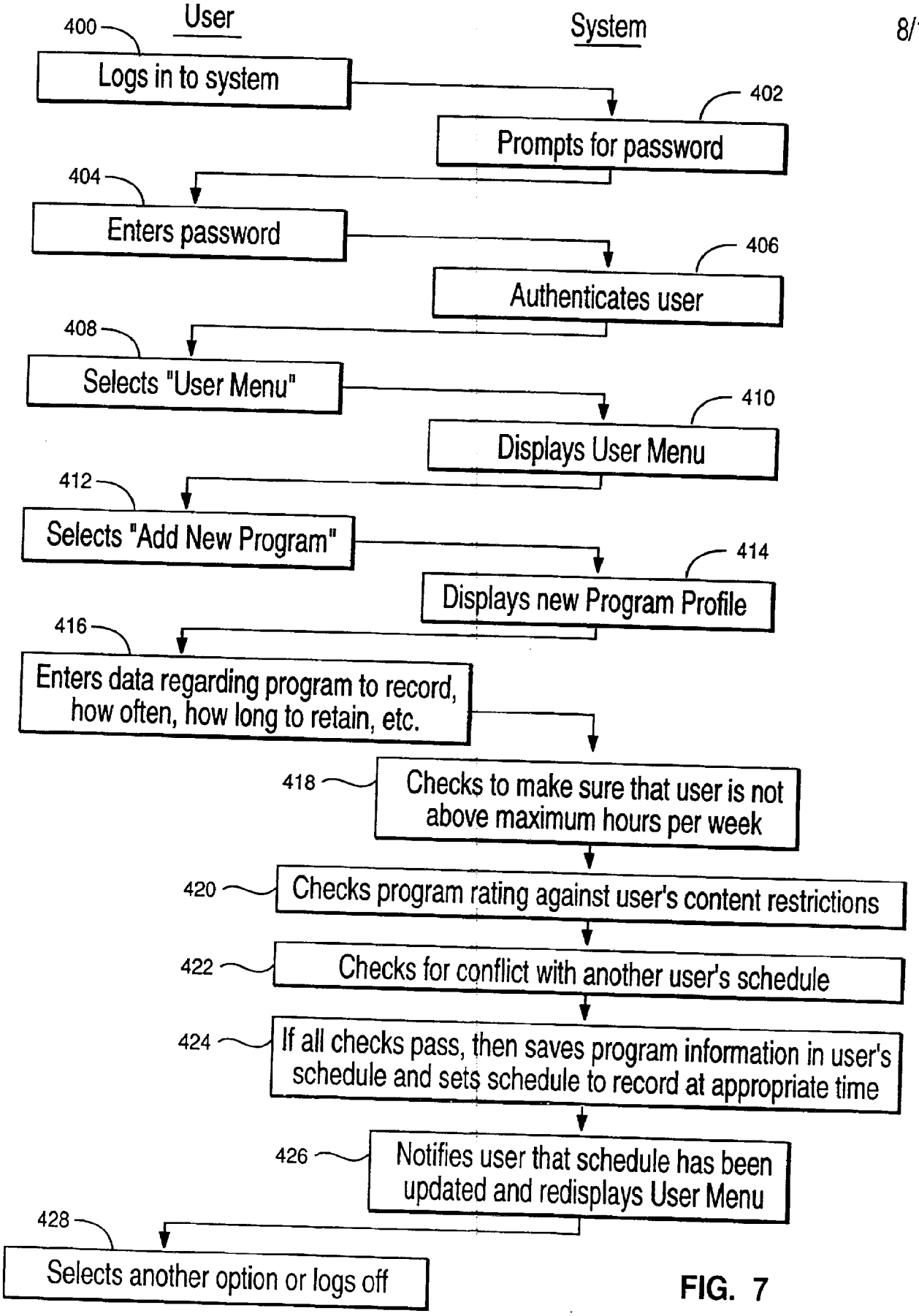
User
System
400
Logs in to system
402
Prompts for password
404
Enters password
406
Authenticates user
408
Selects "User Menu"
410
Displays User Menu
412
Selects "Add New Program"
414
Displays new Program Profile
416
Enters data regarding program to record, how often, how long to retain, etc.
418
Checks to make sure that user is not above maximum hours per week
420
Checks program rating against user's content restrictions
422
Checks for conflict with another user's schedule
424
If all checks pass, then saves program information in user's schedule and sets schedule to record at appropriate time
426
Notifies user that schedule has been updated and redisplays User Menu
428
Selects another option or logs off

FIG. 7

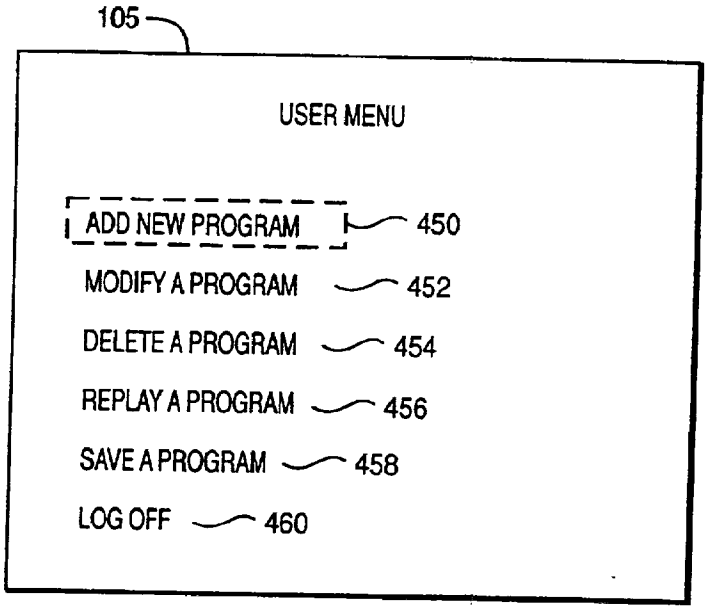
105
USER MENU
ADD NEW PROGRAM
450
MODIFY A PROGRAM
452
DELETE A PROGRAM
454
REPLAY A PROGRAM
456
SAVE A PROGRAM
458
LOG OFF
460

FIG. 8

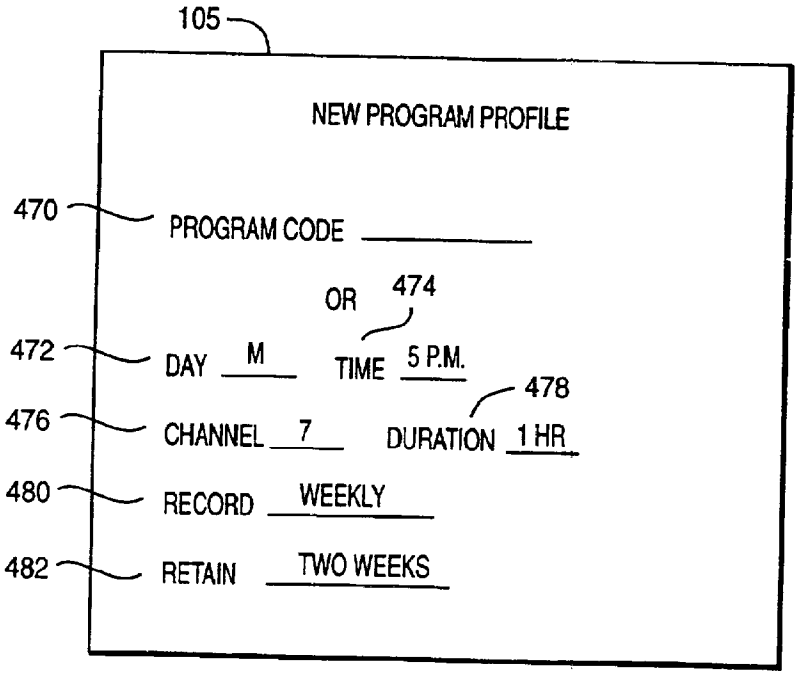
105
NEW PROGRAM PROFILE
470
PROGRAM CODE
OR
474
472
DAY M
TIME 5 P.M.
478
476
CHANNEL 7
DURATION 1 HR
480
RECORD WEEKLY
482
RETAIN TWO WEEKS

FIG. 9

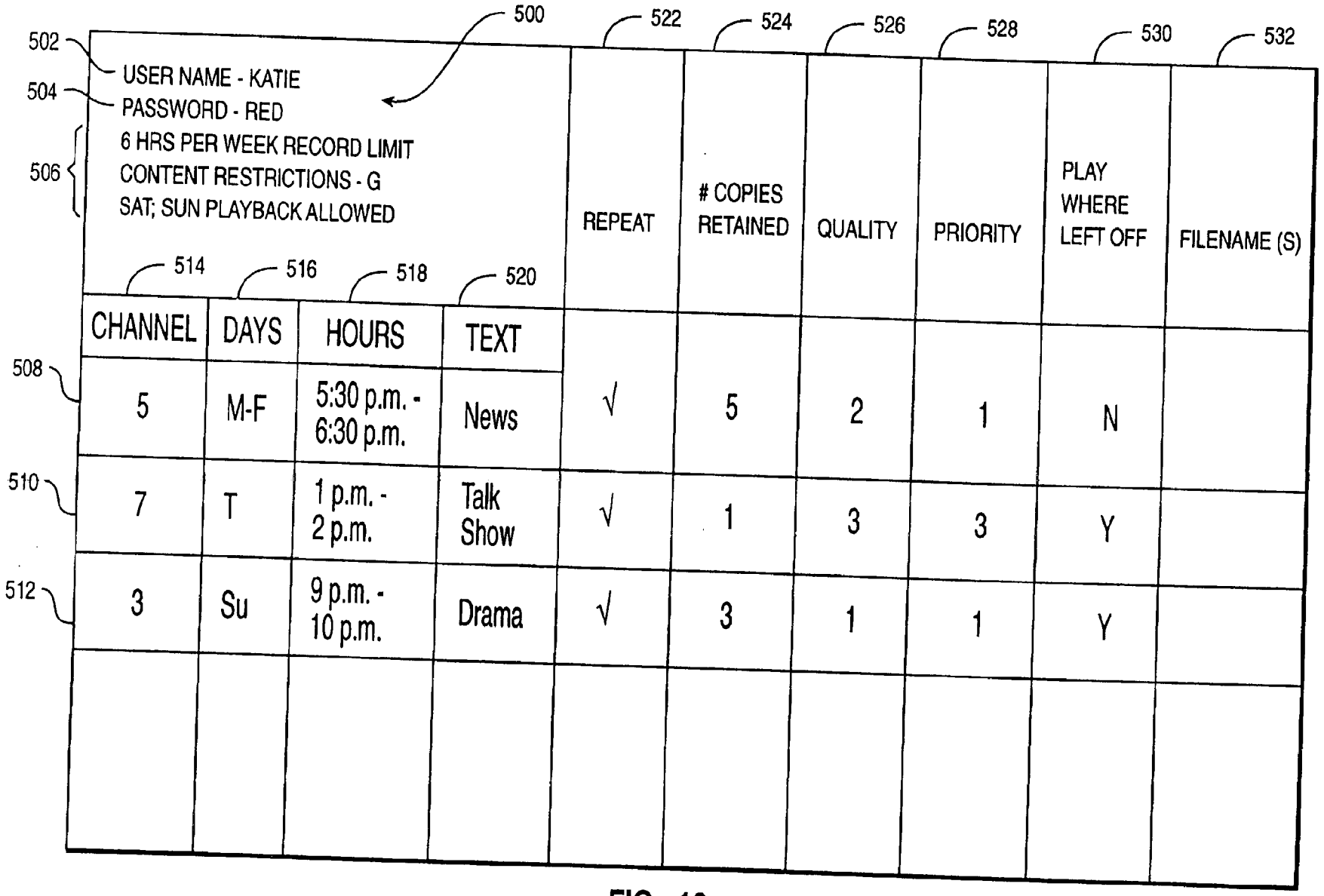
500
502
USER NAME - KATIE
504
PASSWORD - RED
506
6 HRS PER WEEK RECORD LIMIT
CONTENT RESTRICTIONS - G
SAT; SUN PLAYBACK ALLOWED
514
516
518
520
522
524
526
528
530
532
CHANNEL
DAYS
HOURS
TEXT
REPEAT
# COPIES RETAINED
QUALITY
PRIORITY
PLAY WHERE LEFT OFF
FILENAME (S)
508
5
M-F
5:30 p.m. - 6:30 p.m.
News
√
5
2
1
N
510
7
T
1 p.m. - 2 p.m.
Talk Show
√
1
3
3
Y
512
3
Su
9 p.m. - 10 p.m.
Drama
√
3
1
1
Y

FIG. 10

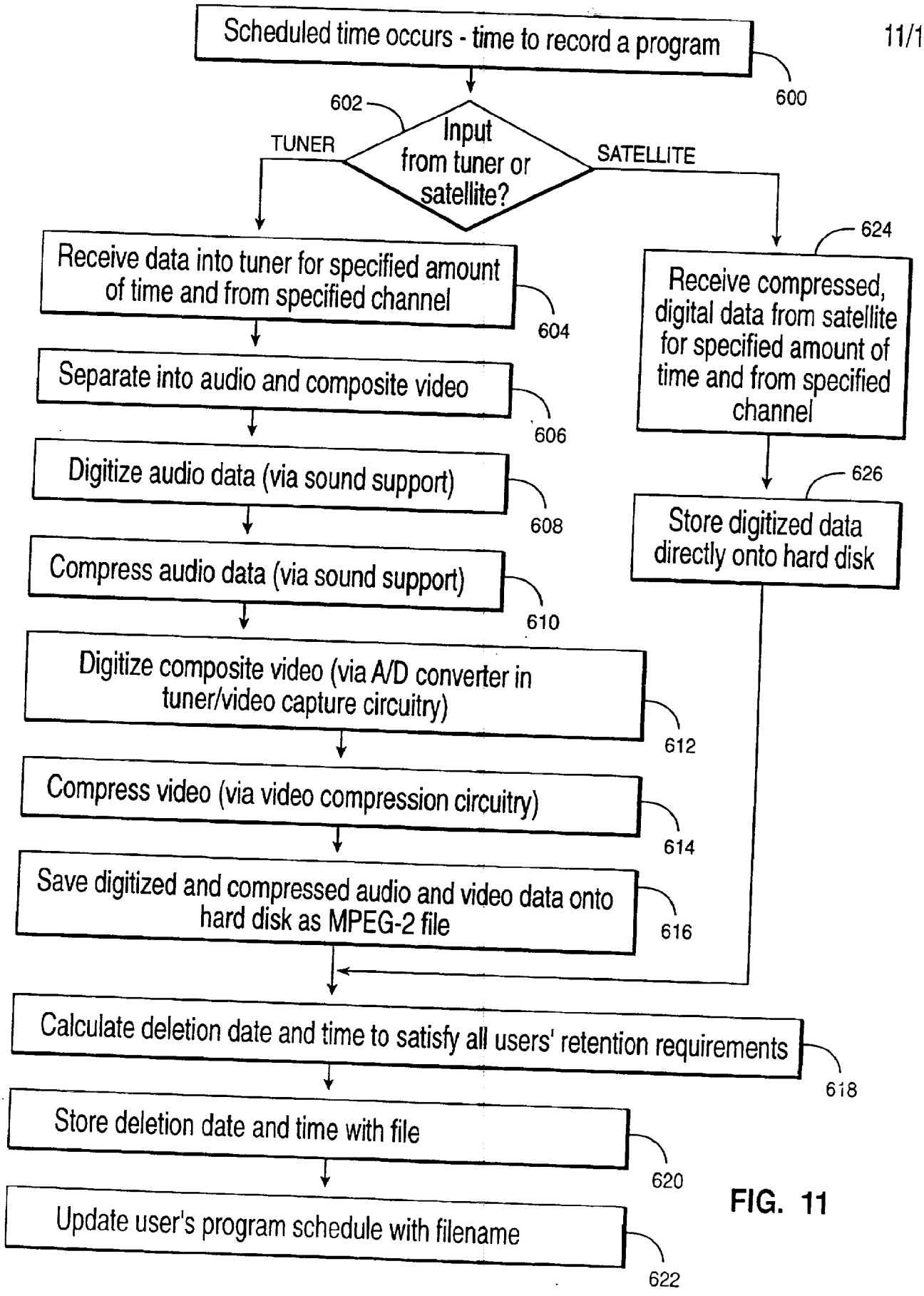
Scheduled time occurs - time to record a program
600
602
Input from tuner or satellite?
TUNER
SATELLITE
Receive data into tuner for specified amount of time and from specified channel
604
Separate into audio and composite video
606
Digitize audio data (via sound support)
608
Compress audio data (via sound support)
610
Digitize composite video (via A/D converter in tuner/video capture circuitry)
612
Compress video (via video compression circuitry)
614
Save digitized and compressed audio and video data onto hard disk as MPEG-2 file
616
624
Receive compressed, digital data from satellite for specified amount of time and from specified channel
626
Store digitized data directly onto hard disk
Calculate deletion date and time to satisfy all users' retention requirements
618
Store deletion date and time with file
620
Update user's program schedule with filename
622

FIG. 11

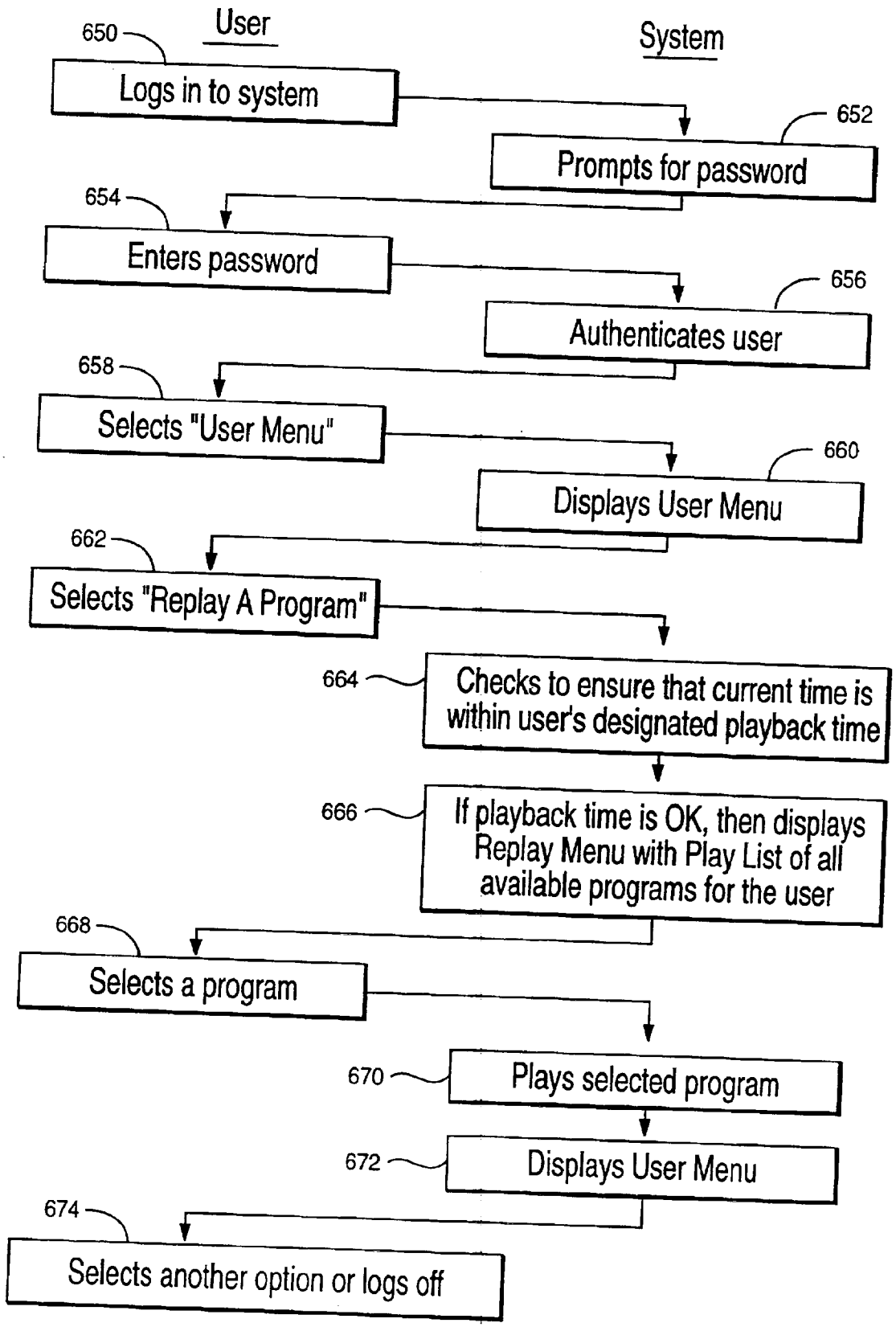
User
System
650
Logs in to system
652
Prompts for password
654
Enters password
656
Authenticates user
658
Selects "User Menu"
660
Displays User Menu
662
Selects "Replay A Program"
664
Checks to ensure that current time is within user's designated playback time
666
If playback time is OK, then displays Replay Menu with Play List of all available programs for the user
668
Selects a program
670
Plays selected program
672
Displays User Menu
674
Selects another option or logs off

FIG. 12

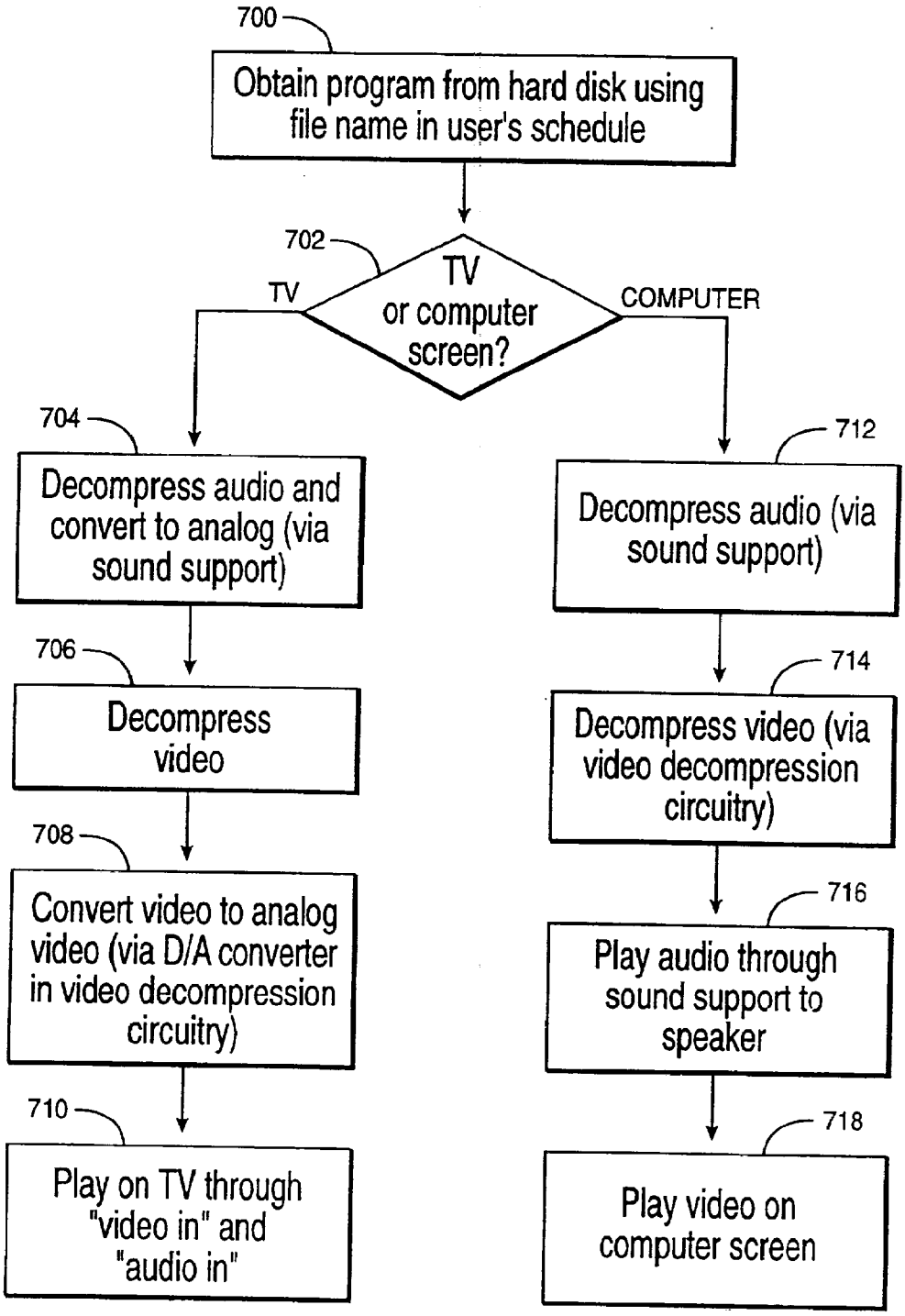
700
Obtain program from hard disk using file name in user's schedule
702
TV or computer screen?
TV
COMPUTER
704
Decompress audio and convert to analog (via sound support)
706
Decompress video
708
Convert video to analog video (via D/A converter in video decompression circuitry)
710
Play on TV through "video in" and "audio in"
712
Decompress audio (via sound support)
714
Decompress video (via video decompression circuitry)
716
Play audio through sound support to speaker
718
Play video on computer screen

FIG. 13

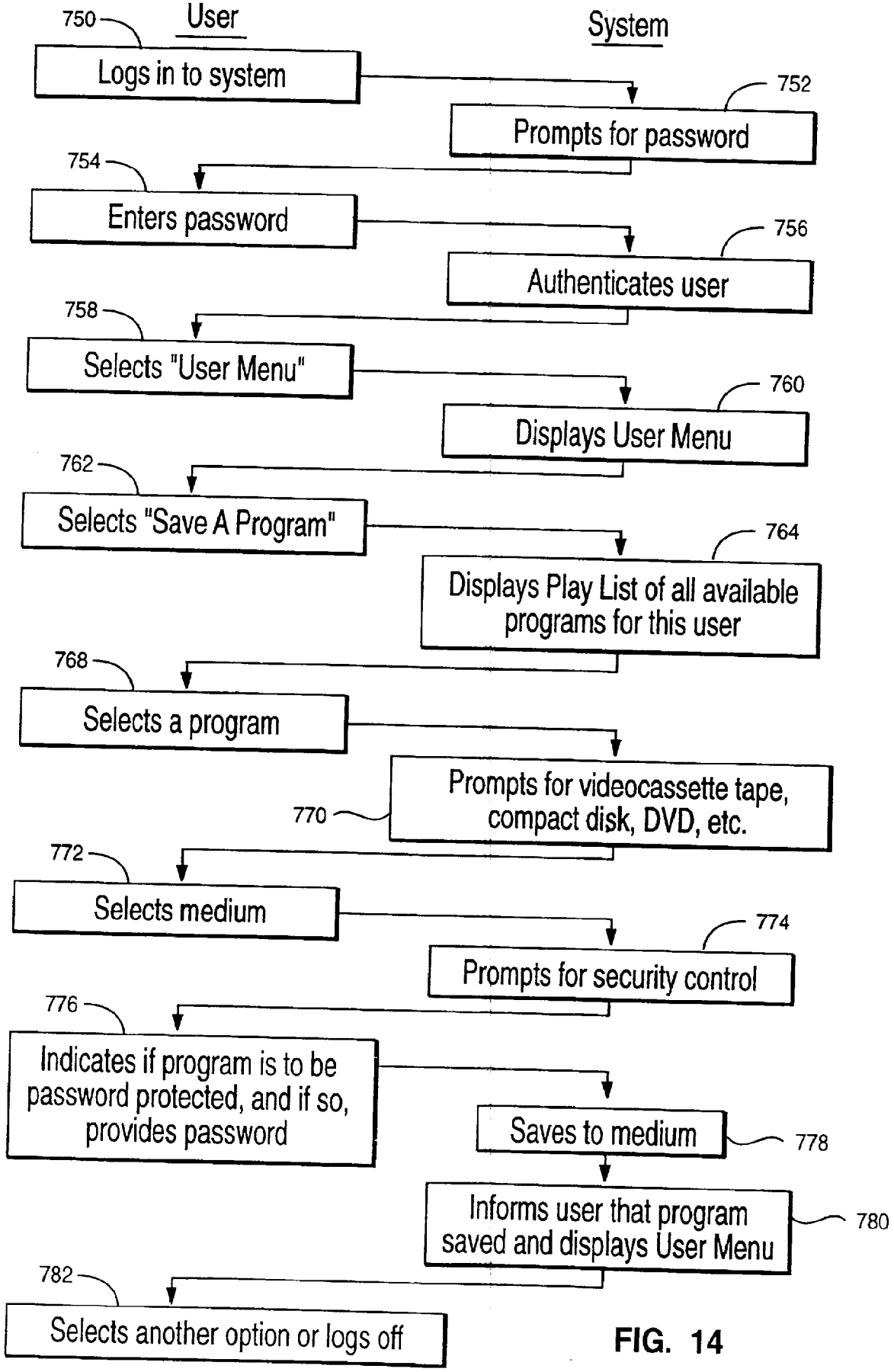
User
System
750
Logs in to system
752
Prompts for password
754
Enters password
756
Authenticates user
758
Selects "User Menu"
760
Displays User Menu
762
Selects "Save A Program"
764
Displays Play List of all available programs for this user
768
Selects a program
770
Prompts for videocassette tape, compact disk, DVD, etc.
772
Selects medium
774
Prompts for security control
776
Indicates if program is to be password protected, and if so, provides password
Saves to medium
778
Informs user that program saved and displays User Menu
780
782
Selects another option or logs off

FIG. 14

MULTI-USER VIDEO RECORDING SYSTEM

The present invention relates to a multi-user video recording system for recording and replaying television programs.

Many television viewers use video cassette recorders (VCRs) to record television programs for later viewing, a process referred to as "time shifting." VCRs allow a viewer to record a television program at any time, and replay the program when it is convenient for the viewer. If several people wish to view the same recorded program, each can replay the program at his convenience.

However, there are several disadvantages associated with VCRs. VCRs are often difficult to program. A videocassette tape can only hold a few hours of programming. Thus, to record many hours of programming, a viewer must steadily feed the VCR with videocassette tapes. Later, the viewer may have to search through many videocassette tapes to find a desired program. If several people use the same videocassette tapes to record programs, then an individual may have to skip over other people's recorded programs to find the program he wishes to view.

VCRs pose additional concerns for parents who wish to limit or screen their children's television viewing. Some parents only allow their children to watch television during certain times of the day or week. However, once a television program has been recorded, a child can replay the program at any time. The only way to ensure that the child can not replay the program is to physically keep the videocassette tape from the child until the child's allowed viewing time. In addition, some parents wish to control which programs, or types of programs, their children are allowed to view. However, if several family members record television programs on the same videocassette tape, a child may view programs that his parents do not wish him to view. This may happen inadvertently, as the child skips over other family member's recorded programs, or on purpose, once the child realises there are more "interesting" programs recorded on the same videocassette tape.

Another problem with current VCRs and videocassette tapes is the problem of reusing tapes. For example, if a particular videocassette tape contains five hours of programming, it may be desirable to retain

some of the recorded programs longer than others. The viewer may desire to retain the first two hours of programming for a week, the third hour of programming for two days, and the third hour of programming for a month. This quickly becomes inconvenient to track, and it is likely that the entire videocassette tape will simply be retained, as is, for at least a month. Thus, portions of tape that could be reused are not reused.

Consequently, it would be desirable to have a system and method for easily recording and replaying audio/video data, such as television programs. It would also be desirable to allow many people to easily use the same system, without having to shuffle through many tapes and skip over each other's recorded programs. It would be desirable to be able to place restrictions on some users regarding the amount and type of television programs that may be recorded and viewed. It would be further desirable to be able to easily retain and erase recorded data.

Accordingly, the present invention provides a multi-user video recording system, comprising means for receiving television program signals, a non-volatile storage means, means responsive to user input for creating a plurality of program schedules each containing data identifying one or more selected television programs to be recorded for a corresponding user, means for recording the selected television programs in said non-volatile storage means as they are broadcast, means responsive to user input for displaying any of a plurality of play lists each identifying one or more television programs that have been saved for a corresponding user, and means responsive to user input for playing a selected one of the television programs in a selected play list.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figures 1A-1D show a system in which the present invention is implemented;

Figure 2 is a block diagram depicting the major components of the system;

Figure 3 is a flow chart depicting a method for adding a new user to the system;

Figures 4, 5, and 6 are exemplary screen displays illustrating steps shown in Figure 3;

Figure 7 is a flow chart depicting a method for setting a recording schedule for a selected program;

Figures 8 and 9 are exemplary screen displays illustrating steps shown in Figure 7;

Figure 10 is an exemplary user schedule;

Figure 11 is a flow chart depicting a method for recording a television program at a pre-selected time;

Figure 12 is a flow chart depicting a method for displaying a saved television program;

Figure 13 is a flow chart depicting further details of the method of Figure 12; and

Figure 14 is a flow chart depicting a method for saving a recorded television program to an alternate storage medium.

With reference now to the figures, and in particular with reference to Figures 1A to 1D, various pictorial representations of an information handling system in which a preferred embodiment of the present invention may be implemented are depicted. Figure 1A is a pictorial representation of the information handling system as a whole. Information handling system 100 in the depicted example is a set-top box providing, with minimal economic costs for hardware to the user, access to the Internet. Information handling system 100 includes a data processing unit 102, which is preferably sized to fit in typical entertainment centres and provides all required functionality conventionally found in personal computers to enable a user to "browse" the Internet. Additionally, data processing unit 102 may provide other common functions such as, for example, serving as an answering machine, transmitting or receiving facsimile transmissions, or providing voice mail facilities.

Data processing unit 102 is connected to television 104 for display of graphical information on display screen 105. Television 104 may be any suitable television, although colour televisions with an S-Video input will provide better presentations of the graphical information. Data processing unit 102 may be connected to television 104 through a standard coaxial cable connection. A remote control unit 106 allows a user to interact with and control data processing unit 102. Remote control unit 106 emits infrared (IR) signals, preferably modulated at a different frequency than the normal television, stereo, and VCR infrared remote control frequencies in order to avoid interference. Remote control unit 106 provides the functionality of a pointing device in conventional personal computers, including the ability to move a cursor on a display and select items.

Figure 1B is a pictorial representation of the front panel of data processing unit 102 in accordance with a preferred embodiment of the present invention. The front panel includes an infrared window 108 for receiving signals from remote control unit 106 and for transmitting infrared signals. Data processing unit 102 may transmit infrared signals to be reflected off objects or surfaces, allowing data processing unit 102 to automatically control television 104. Volume control 110 permits adjustment of the sound level emanating from a speaker within data processing unit 102 or from television 104. A plurality of light-emitting diode (LED) indicators 112 provide an indication to the user of when data processing unit 102 is on, whether the user has messages, whether the modem/phone line is in use, or whether data processing unit 102 requires service.

Figure 1C is a pictorial representation of the rear panel of data processing unit 102 in accordance with a preferred embodiment of the present invention. A three wire (ground included) insulated power cord 114 passes through the rear panel. Standard telephone jacks 116 and 118 on the rear panel provide an input to a modem from the phone line and an output to a handset (not shown). The rear panel also provides a standard computer keyboard connection 120, mouse port 122, computer monitor port 124, printer port 126, and an additional serial port 128. These connections may be employed to allow data processing unit 102 to operate in the manner of a conventional personal computer. Game port 130 on the rear panel provides a connection for a joystick or other gaming control device (glove, etc.). Infrared extension jack 132 allows a cabled

infrared LED to be used to transmit infrared signals. Microphone jack 134 allows an external microphone to be connected to data processing unit 102. Video in (V IN) 150 receives video data (e.g., from television 104 or from a VCR). Digital Satellite in (DS IN) 152 receives compressed, digital audio and video data from a satellite receiver (not shown), while Antenna in (A IN) 154 receives audio and video data from an antenna connection (not shown).

Video connection 136, a standard coaxial cable connector, connects to the video-in terminal of television 104. Left and right audio jacks 138 connect to the corresponding audio-in connectors on television 104 or to a stereo (not shown). If the user has S-Video input, then S-Video connection 140 may be used to connect to television 104 to provide a better picture than the composite signal. If television 104 has no video inputs, an external channel 3/4 modulator (not shown) may be connected in-line with the antenna connection.

Figure 1D is a pictorial representation of remote control unit 106 in accordance with a preferred embodiment of the present invention. Similar to a standard telephone keypad, remote control unit 106 includes buttons 142 for Arabic numerals 0 to 9, the asterisk or "star" symbol (*), and the pound sign (#). Remote control unit also includes "TV" button 144 for selectively viewing television broadcasts and "Web" button 146 for initiating "browsing" of the Internet. A pointing device 147, which is preferably a track point or "button" pointing device, is included on remote control unit 106 and allows a user to manipulate a cursor on the display of television 104. "Go" and "Back" buttons 148 and 150, respectively, allow a user to select an option or return to a previous selection. "Menu" button 152 causes a context-sensitive menu of options to be displayed, while home button 154 allows to user to return to a default display of options. "PgUp" and "PgDn" buttons 156 and 158 allows the user to change the content of the display in display-sized blocks rather than by scrolling. The message button 160 allows the user to retrieve messages. In addition to, or in lieu of, remote control unit 106, an infrared keyboard (not shown) with an integral pointing device may be used to control data processing unit 102. The integral pointing device is preferably a track point or button type of pointing device. A wired keyboard (also not shown) may also be used through keyboard connection 120, and a wired pointing device such as a mouse or track ball may be used through mouse port 122. When a user has one or more of the

remote control units 106, infrared keyboard, wired keyboard and/or wired pointing device operable, the active device locks out all others until a prescribed period of inactivity has passed.

Referring now to Figure 2, a block diagram of the major components of data processing unit 102 in accordance with a preferred embodiment of the present invention is portrayed. As with conventional personal computers, data processing unit 102 includes a motherboard 202 containing at least one processor 204 and memory 206 connected to system bus 208. Processor 204 is preferably at least a 486 processor operating at or above 100 MHz. Memory 206 includes read only memory (ROM) 206a containing a basic input/output services (BIOS) routine and may include cache memory and/or video RAM.

Video/TV converter 210 on motherboard 202 and connected to system bus 208 generates computer video signals for computer monitors, a composite television signal, and an S-Video signal. The functionality of video/TV converter 210 may be provided using commercially available video and converter chips. Video decompression circuitry 211 decompresses video data before it is sent to video/TV converter 210. Keyboard/remote control interface unit 212 on motherboard 202 receives keyboard codes through controller 214, regardless of whether a wired keyboard/pointing device or an infrared keyboard/remote control is being employed. Infrared remote control unit 106 transmits signals which are ultimately sent to the serial port as control signals generated by conventional mouse or pointing device movements. Two buttons on remote control unit 106 are interpreted identically to the two buttons on a conventional mouse, while the remainder of the buttons transmit signals corresponding to keystrokes on an infrared keyboard. Thus, remote control unit 106 has a subset of the functions provided by an infrared keyboard. Connectors/indicators 216 on motherboard 202 provide the connections and indicators on data processing unit 102 described above.

Tuner/video capture circuitry 228 receives television signals, via cable connection 233 or via antenna 229. Tuner/video capture circuitry 228 separates the incoming television signals into audio signals and video signals. The video signals are converted from analogue to digital signals, and then may be compressed, via video compression circuitry 230. In the described embodiment, video compression circuitry 230 is MPEG-2 compression circuitry, although one skilled in the art will realise that

other types of compression, such as MPEG-1, may also be used. Tuner/video capture circuitry 228 may also include a V-chip 231, or other type of screening circuitry.

Sound support 226 includes circuitry to convert audio signals from analogue to digital, and vice versa. Sound support 226 also includes circuitry to compress and decompress digital audio signals. Audio signals may be sent from sound support 226 to speaker 224 and/or the audio in connection of television 104.

External to motherboard 202 in the depicted example are power supply 218, hard disk 220, and modem 222. External Power supply 218 is a conventional power supply except that it receives a control signal from controller 214 which effects shut down of all power to motherboard 202, hard drive 220, and modem 222. In some recovery situations, removing power and rebooting is the only guaranteed method of resetting all of these devices to a known state. Thus power supply 218, in response to a signal from controller 214, is capable of powering down and restarting data processing unit 102.

Hard disk 220 contains operating system and applications software for data processing unit 102. Data, such as television program data, is also be stored on hard disk 220. Modem 222, inserted into a slot mounted sideways on motherboard 202, is preferably a 33.6 kbps modem supporting the V.42bis, V34bis, V.34, V.17 Fax, MNP 1-5, and AT command sets.

Controller 214 is preferably one or more of the 805x family of controllers. Controller 214 is continuously powered and, when data processing unit 102 is turned on, monitors the system for a periodic "ping" indicating that data processing unit 102 is operating normally. In the event that controller 214 does not receive a ping within a prescribed timeout period, controller 214 removes power from the system and restarts the system. This may be necessary, for example, when the system experiences a general protection fault. If multiple attempts to restart the system prove unsuccessful, controller 214 shuts off data processing unit 102 and signals that service is required through indicators 216. Thus, data processing unit 102 is capable of self-recovery in some circumstances without involvement by a user.

Controller 214 also receives and processes input from infrared remote control 106, infrared keyboard, wired keyboard, or wired mouse. When one keyboard or pointing device is used, all others are locked out (ignored) until none have been active for a prescribed period. Then the first keyboard or pointing device to generate activity locks out all others. Controller 214 also directly controls all LED indicators except that indicating modem use and specifies the boot sector selection during any power off-on cycle.

Those skilled in the art will recognise that the components depicted in Figures 1A-1D and 2 and described above may be varied for specific applications or embodiments.

The present embodiment is a multi-user video hard disk recorder system and method for recording and storing television programs on a hard disk for later viewing by users. The system and method support multiple users, with each user identified by an associated user profile. An individual user logs into the system and specifies which television programs he wishes to have recorded and stored. The system maintains a program schedule for each user, and records and stores desired television programs for each user. Each user can then log into the system, at his convenience, and view any of the television programs that have been recorded for him. There is no shuffling through numerous videocassette tapes or skipping over other users' recorded programs to find a desired television program.

The television programs are stored on a hard disk, or in another non-volatile storage, preferably in a compressed format. Compressing the television programs allows many hours of programming to be stored on a hard disk. For example, it is possible to store up to 20 hours of suitably compressed television programming on an 11 gigabyte hard drive. An option may be used to specify how long to save a recorded television program before it can be erased and overwritten with another program. For example, weekly shows may be erased after one or two weeks, daily news shows may be erased after one or two days, lottery results may be saved until the next lottery drawing, and so on. If more than one user chooses to have the same television show recorded and saved, then the show is saved for a long enough period of time to satisfy all users' retention requirements for the show.

A master user or users, such as a parent or parents, can add a new user to the system by setting up a new user profile. The master user may set restrictions for the new user. For example, the new user may only be allowed to record and/or view a certain number of hours of television programming per week. The new user may only be allowed to view his saved television programs at certain times during the week, such as on weekends. The master user may also restrict the type of shows the new user can record (e.g., by using V-chip ratings), or prevent the user from recording particular shows or shows that are broadcast during certain time periods or on certain channels.

If a permanent copy of a television program is desired, it can be written to another medium, such as a compact disk, a DVD, or a videocassette tape. Security controls may be used to keep all others, or some selected others, from viewing a program that has been saved to another medium.

By using the present embodiment, users do not have to keep track of which tapes are being fed into a VCR to record which shows. There is no need to skip over other people's shows to view a desired show. Parents can have greater control over the amount and type of shows viewed by their children, and can limit their children's viewing time to certain time periods.

Referring to Figure 3, a method for adding a new user to the system will now be described. The master user, e.g., a parent, logs in as the master user (step 300). The system prompts the master user for a password (step 302). The user enters his password (step 304), and the system authenticates him as the master user (step 306). Note that steps 300 to 306 could be replaced by various other types of security mechanisms, such as a smart card that authenticates the master user. The master user selects "Master User Options" (step 308). Note that this selection may be accomplished via a selection list, pull-down menu, or another type of selection mechanism.

The system displays a Master User Menu (step 310). An exemplary Master User Menu is shown in Figure 4, as it may appear on screen 105 of television 104. As shown in Figure 4, the master user may be presented with a variety of options, such as Add New User 350, Modify User Profile

352, Delete User 354, and Log Off 356. In Figure 4, Add New User 350 has been highlighted by the master user, as depicted in step 312 of Figure 3.

Referring back to Figure 3, the system displays a New User Menu with some default settings (i.e. options) already filled in (step 314). An exemplary New User Menu is shown in Figure 5. A space is provided to fill in the new user's name 360, password 362, and other options and/or restrictions. The restrictions shown in Figure 5 include maximum hours per time period which may be recorded 364, content restrictions 368, and playback hours 370. Those skilled in the art will realise that a variety of different settings or options may be available for a new user. The restrictions shown in Figures 5 and 6 are for illustrative purposes only, and are not meant to be limiting.

Referring back to Figure 3, the master user enters the new user's name and selects a password for the new user (step 316). Rather than setting a password, a variety of security controls may be used for each user in the system. As discussed above, these security controls may include a smart card for each user, or some other type of security mechanism. The master user may also overwrite any of the default settings for the new user (step 318). In the example shown in Figure 6, the master user has changed the maximum hours per time period 364 from "24 hours per day" to "6 hours per week." Content restriction 368 has been changed from "none" to "G," thus indicating that only television programs with a V-chip rating of "G" may be recorded. Also, playback hours 370 have been changed from "all" to "Sat;Sun," indicating that the new user can only view recorded shows on Saturday and Sunday. Referring back to Figure 3, after the master user has completed the user profile, it is saved by the system (step 320). The system informs the master user that the user profile is saved, and then redisplays the Master User menu (step 322). The master user then selects another option or logs off (step 324). Those skilled in the art will realise that a variety of settings, options, and user preferences may be set for a user. The examples shown in Figures 3 to 6 are for illustrative purposes only, and are not meant to be limiting.

Referring to Figure 7, a method for adding a program to a user's program schedule will now be described. The program schedule for a user contains data regarding the television programs that are to be recorded and saved for the user. As shown in Figure 7, the user logs into the

system (step 400), the system prompts the user for his password (step 402), the user enters his password (step 404), and the system authenticates the user (step 406). The user then selects "User Menu," (step 408), and the system displays the User Menu (step 410). An exemplary User Menu is shown in Figure 8. As shown in Figure 8, the user is presented with a variety of options, such as Add New Program 450, Modify A Program 452, Delete A Program 454, Replay A Program 456, Save A Program 458, and Log Off 460. In the example shown in Figure 8, the user has highlighted Add New Program 450, as indicated in step 412 of Figure 7.

Referring back to Figure 7, the system displays the New Program Profile (step 414). An exemplary New Program Profile is shown in Figure 9. The user enters data regarding the new program to be added to his program schedule (step 416). As shown in Figure 9, the user may select a program based on a program code 470, or may specify a day 472, time 474, channel 476, and duration 478 for recording. The user specifies how often the selected television program is to be recorded 480, and how long it is to be retained 482. Those skilled in the art will realise that there are a variety of other options that a user may specify regarding the television program. Some of these options are discussed below, with reference to Figure 10.

Referring back to Figure 7, the system checks the user's choices against the restrictions set in his user profile. The system checks to ensure that the user is not attempting to record more than his maximum allowed hours per time period (step 418), and that the selected program is allowed within the user's content restrictions (step 420). The system also checks to ensure that the user's request does not conflict with another user's request for the same time period (step 422). In other words, a user can not request that a television program be recorded for him at a particular time on a particular channel if another user has already requested that a different television program be recorded at the same time on a different channel. Of course, the system may record the same television program for more than one user. Also, as discussed below with reference to Figure 11, the system may record different shows at the same time, if there is more than tuner/video capture circuit in the system. One skilled in the art will realise that other checks may be made at this point, depending on the types of restrictions and user preferences that are set in the user profile. If the user's selection

passes all checks, the program information is saved in the user's program schedule, and the system adds the requested television program to the user's program schedule to record the program at the appropriate time (step 424). The system notifies the user that his schedule has been updated, and then redisplays the User Menu (step 426). The user then selects another option or logs off (step 428).

An exemplary user profile and program schedule, as it may be saved by the system, is illustrated in Figure 10. Referring now to Figure 10, user profile data 500, includes the user name 502, password 504, and restrictions 506. In the example shown in Figure 10, there are three entries 508, 510, and 512 listed in the user's program schedule. Each entry indicates the channel 514, days of the week 516, and hours 518 to record, along with a text description of the television program to be recorded 520. Various options may be selected for each entry in the program schedule. As discussed above, with reference to Figure 7, there are a variety of options that may be set. For example, the user may request that a television program be repeatedly recorded, i.e. recorded on a regular basis. This selection is indicated in Repeat column 522. The user may specify the number of repeated recordings to retain, i.e. # Copies Retained 524. A quality 526 may be selected, indicating the quality of the compression to be used when storing the television program on to the hard disk. The higher the quality selected, the more space the television program will take on the hard disk. A priority 528 may be set, indicating the importance of recording the show. In the case where more than one user wishes to have a television show recorded at the same time, the priority setting could be used to determine which show is recorded. An option may be set to allow a user to continue playing a recorded show where it left off the last time the user was watching the show. This option is specified in Play Where Left Off column 530.

When a television program is recorded and stored for a user, the system adds the filename 532 of the stored file to the appropriate entry. More than one filename 532 may be entered for a given entry, as more than one copy of a television program may be kept for the user.

Referring to Figure 11, a method for recording and saving a television program will now be described. The system determines (via a timer program) that a scheduled time has arrived, and it is time to record a television program (step 600). The system determines if the

television input is from a tuner or a satellite (step 602). If the input is from a tuner, the program is received into the tuner for the specified length of time and from the appropriate channel (step 604). Those skilled in the art will realise that more than one television program may be recorded at the same time (e.g., if multiple users desire to have different shows recorded at the same time) by using multiple tuners.

The television signal is separated into its audio component and its composite video component (step 606) by tuner/video capture circuitry 228 (shown in Figure 2). The audio data is digitised (step 608) and compressed (step 610) via sound support 226 (shown in Figure 2). The video data is also digitised (step 612) by tuner/video capture circuitry 228, and then compressed (step 614) by video compression circuitry 230 (shown in Figure 2). In the described embodiment, the compression is performed by MPEG-2 compression circuitry, however, one skilled in the art will realise that the compression may be accomplished via another type of compression circuit, or by a software compression program. The compression format may be MPEG-1, or some other known compression format.

The digitised, compressed audio data and the digitised, compressed video data are stored onto hard disk 220 (shown in Figure 2) (step 616). In the described embodiment, they are stored as an MPEG-2 compressed file or files. A deletion time and date is calculated (step 618) and saved with the file (step 620). As discussed above, if more than one user has requested that a particular television program be recorded and saved, the deletion time and date is calculated to satisfy all the users' retention requirements. The user's program schedule is then updated with the filename of the saved file(s) (step 622).

If the television program is received from a satellite into a satellite receiver (i.e. the answer to the question in step 602 is "satellite"), the television program may already be in compressed, digital form. Thus, the data is received from the satellite for the specified amount of time and from the specified channel (step 624), and stored directly onto hard disk 220 (shown in Figure 2) (step 626). Note that if the data received from the satellite is not compressed, it may be compressed by video compression circuitry 230 (shown in Figure 2). The method then continues at step 618.

Referring to Figure 12, a method for displaying a recorded television program for a user will now be described. As shown in Figure 12, the user logs into the system (step 650), the system prompts the user for his password (step 652), the user enters his password (step 654), and the system authenticates the user (step 656). The user then selects "User Menu," (step 658), and the system displays the User Menu (step 660). An exemplary User Menu is shown in Figure 8. For purposes of the example, assume the users highlights Replay A Program 456. Referring again to Figure 12, this step is depicted in step 662. The system checks the current time to ensure that it is within the user's allowed playback time (step 664). Note that other checks may be performed at this point. For example, if the user has a restriction regarding the number of hours of television program he may view per week, the system will check to ensure that the user has not already viewed television programs for more than the designated amount of time for the week. If all checks pass, a Repay Menu is displayed for the user, displaying the user's Play List (step 666). The Play List includes all the television programs that are stored and available for the user to view, and is obtained by searching the user's program schedule for entries with filenames indicating stored television programs. The user selects a television program from the Play List (step 668), and the selected television program is displayed for the user (step 670). After the television program is complete, the system displays the User Menu (step 672), and the user selects another option or logs off (step 674).

Referring to Figure 13, further details regarding step 670 will be described. The selected television program is obtained from the hard disk (step 700) using the filename stored with the appropriate entry in the user's program schedule. The system determines whether the television program will be displayed on a television screen or a computer screen (step 702). If the television program is to be displayed on a television screen, the audio data is decompressed and converted to an analogue audio signal (step 704) using sound support 226 (shown in Figure 2). The video data is decompressed (step 706) by video decompression circuitry 211, and then converted to an analogue video signal (step 708) using a digital-to-analogue converter circuit in the decompression circuitry. The analogue audio and video signals are then displayed through the "audio in" and "video in" connections on the television (step 710). If the television program is to be displayed on a computer screen (i.e. the answer to the question in step 702 is "computer"), then the

audio data is decompressed and converted to an analogue audio signal (step 712) by sound support 226. The video data is decompressed (step 714) by video decompression circuitry 211. The decompressed, analogue audio signal is played through speaker 224 (step 716), and the decompressed video data is displayed on the computer screen (step 718).

Referring to Figure 14, a method for saving a stored television program to an alternate medium will now be described. As shown in Figure 14, the user logs into the system (step 750), the system prompts the user for his password (step 752), the user enters his password (step 754), and the system authenticates the user (step 756). The user then selects "User Menu," (step 758), and the system displays the User Menu (step 760). An exemplary User Menu is shown in Figure 8. For purposes of the example, assume the users highlights Save A Program 458. Referring again to Figure 14, this step is depicted in step 762. The system then displays the user's Play List, displaying all available programs that have been saved onto the hard disk for the user (step 764). The user selects a television program to save (step 768). The system prompts the user for the type of medium (e.g., videocassette tape, compact disk, DVD, etc.) (step 770), and the user selects the desired medium (step 772). The system then prompts the user for any security controls (step 774), and, if desired the user may protect the television program with a password, or some other security mechanism (step 776). The system then saves the selected television program to the selected medium for the user (step 778). The system informs the user that the television program has been saved, and then displays the User Menu (step 780). The user then selects another option or logs off (step 782).

Other embodiments than that described above are possible. One implementation of the invention is as sets of instructions resident in the memory of one or more computer systems configured generally as described in Figure 2. Until required by the computer system, the set of instructions may be stored in another computer readable memory, for example in a hard disk drive, or in a removable memory such as an optical disk for eventual use in a CD-ROM drive or a floppy disk for eventual use in a floppy disk drive. Further, the set of instructions can be stored in the memory of another computer and transmitted over a local area network or a wide area network, such as the Internet, when desired by the user. One skilled in the art will appreciate that the physical storage of the sets of instructions physically changes the medium upon which it

is stored electrically, magnetically, or chemically so that the medium carries computer usable information.

CLAIMS

1. A multi-user video recording system, comprising means for receiving television program signals, a non-volatile storage means, means responsive to user input for creating a plurality of program schedules each containing data identifying one or more selected television programs to be recorded for a corresponding user, means for recording the selected television programs in said non-volatile storage means as they are broadcast, means responsive to user input for displaying any of a plurality of play lists each identifying one or more television programs that have been saved for a corresponding user, and means responsive to user input for playing a selected one of the television programs in a selected play list.

2. A system according to claim 1, further comprising means for creating a plurality of user profiles each containing one or more options for a corresponding user.

3. A system according to claim 2, wherein said means for creating a plurality of program schedules comprises means for receiving a request from a user to record a desired television program, and means for determining if recording the desired television program violates any of the options in the user's profile, data identifying the desired television program being added to the user's program schedule only if no violation is determined.

4. A system according to claim 2 or 3, further comprising means for determining if playing a selected television program by a user would violate any of the options in the user's profile, the selected television program being played only if no violation is determined.

5. A system according to claim 2, 3 or 4, wherein the user profiles are created in response to one or more requests from a master user.

6. A system according to any one of claims 2 to 5, wherein the options include a number of television hours that may be recorded within a designated time period.

7. A system according to any one of claims 2 to 6, wherein the options include a content restriction which determines a type of television program that may be recorded.

8. A system according any one of claims 2 to 7, wherein the options include a playback time restriction which determines a time period in which television programs may be played.

9. A system according to any one of claims 2 to 8, wherein said means for recording comprises means for separating a received television program signal into an audio signal and a video signal, means for digitising the audio signal into a digitised audio signal, means for digitising the video signal into a digitised video signal, means for compressing the digitised audio signal into a compressed, digitised audio signal, means for compressing the digitised video signal into a compressed, digitised audio signal, and means for saving the compressed, digitised audio signal and the compressed, digitised video signal as one or more files on a hard disk.

10. A system according to claim 9, wherein said means for playing comprises means for obtaining the files associated with the selected television program from the hard disk, means for decompressing the compressed, digitised video signal into an uncompressed, digitised video signal, means for decompressing the compressed, digitised audio signal into an uncompressed, digitised audio signal, means for converting the uncompressed, digitised video signal into an analogue video signal, means for converting the uncompressed, digitised audio signal into an analogue audio signal, a video display screen for playing the analogue video signal, and a speaker for playing the analogue audio signal.

11. A system according to any one of claims 2 to 10, wherein said means for recording further comprises a tuner/video capture circuit for separating a received television program signal into an audio signal and a video signal, and for digitising the video signal into a digitised video signal, a compression circuit for compressing the digitised video signal into a compressed, digitised video signal, a sound support circuit for digitising the audio signal into a digitised audio signal, and for compressing the digitised audio signal into a compressed, digitised audio signal, and means for saving the compressed, digitised audio signal and

the compressed, digitised video signal on a hard disk as one or more MPEG-2 files.

12. A system according to any preceding claim, wherein said means for receiving television program signals comprises an antenna connected to said tuner/video capture circuit.

13. A system according to any preceding claim, wherein said means for receiving television program signals comprises a cable connected to said tuner/video capture circuit.

14. A system according to any preceding claim, wherein said means for receiving television program signals comprises a satellite receiver for receiving television program signals from a satellite which include compressed, digital audio signals and compressed, digital video signals.

15. A system according to any preceding claim, further comprising a further storage means, means for receiving a save request from a user to save a particular television program to said further storage means, and means for saving the particular television program in said further storage means.

16. A computer program product comprising a computer program recorded on a computer-usable medium, for use in recording and playing television programs for a plurality of users, the computer program comprising means responsive to user input for creating a plurality of program schedules each containing data identifying one or more selected television programs to be recorded for a corresponding user, means for causing the selected television programs to be recorded in a non-volatile storage means as they are broadcast, means responsive to user input for displaying any of a plurality of play lists each identifying one or more television programs that have been saved for a corresponding user, and means responsive to user input for playing a selected one of the television programs in a selected play list.

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Claims searched: 1-16

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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): G5R (RAB), (RAC), (RAD), (RHB), (RHX); H4F (FBB)

Int Cl (Ed.7): G11B 31/00; H04N 5/445, 5/76, 5/761, 5/7613, 5/7617, 7/088,7/16, 7/173

Other: Online: EPODOC, WPI, PAJ

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	WO 97/46016 A1 (STARSIGHT TELECAST INC)	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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